

## Discussion question

Show that Turing pattern formation through a diffusion-driven instability of a homogenous steady-state solution cannot occur for the single species reaction diffusion equation

$$\frac{\partial u}{\partial t} = D \frac{\partial^2 u}{\partial x^2} + f(u)$$

with no flux boundary conditions and any reaction kinetics  $f(u)$  and constant diffusivity  $D$ .

1. Determine conditions for which the equation is linearly stable in the diffusion-free case.
2. Using the wave number or otherwise, find solutions of the equation with diffusion and show that there are no diffusion-driven instabilities.